Advanced Near Net Shape Technology (ANNST) - Integrally Stiffened Cylinder (ISC)

Completed Technology Project (2016 - 2019)

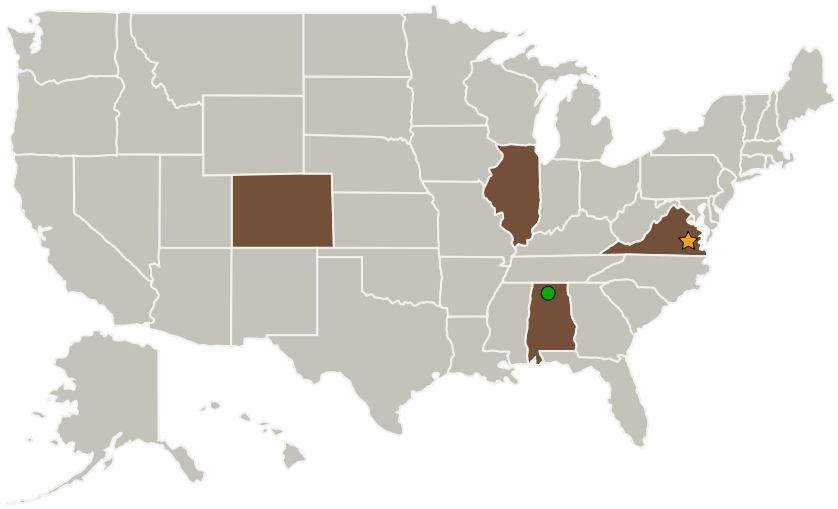
Project Introduction

The Integrally Stiffened Cylinder (ISC) Process is a new and revolutionary manufacturing technique that could drastically reduce the cost of fabricating rocket structural hardware. Specifically, the adaption of a commercial automotive process will enable us to make future large rocket fuel tanks, like the External Tank of the retired Space Shuttle, which are greener, safer, and lighter. Both US industry and ESA have invested in ISC development. Plans are in place to bring this technology from Germany to the US after we successfully demonstrate the ISC process at the 10 ft. diameter scale in spring 2017.

Anticipated Benefits

Benefits to NASA's vision for Mars exploration through deployment in commercial launch systems the are relied on for low earth orbit, cislunar operations, and lunar orbit missions. Further process scale up can benefit the SLS launch system.Leverage of the ISC process to commercial aviation for single-piece fuelage structure;Fabrication of lower cost missile and small launch vehicle structures using the ISC process will lenable more efficient production of munitions systems and enable larger arsenals.;10 foot diameter

Primary U.S. Work Locations and Key Partners



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Game Changing Development

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Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
●Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Colorado
Illinois	Virginia

Project Transitions

October 2016: Project Start

September 2019: Closed out

Closeout Summary: The goal of the Advanced Near Net Shape Technology (ANNST) project was to improve near net shape manufacturing methods for rib stiffened cryogenic fluid storage tanks. Prior work leading into the development effort had established manufacturing proof-of-concept of an integrally stiffened cylinder process by which a single-piece cylinder could be manufactured using integrally formed stiffeners through a plastic-deformation flow forming process. Previous state-of-art processes required welding and machining of multiple pieces to form a complete tank. The current effort focused on advancing the manufacturing readiness level to 5-6 for the ISC process for a scaled tank size viable for transition to the commercial launch industry. A successful forming campaign demonstrated scale-up to 10-foot diameter tanks with aluminum alloy 6061.

Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Game Changing Development

Project Management

Program Director:

Mary J Werkheiser

Program Manager:

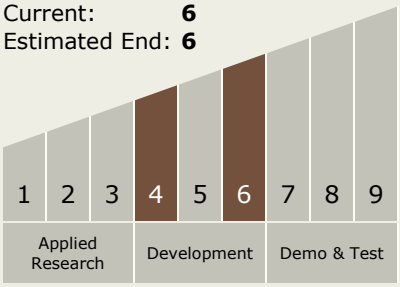
Gary F Meyering

Principal Investigator:

Marcia S Domack

Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



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Target Destinations

Earth, The Moon, Mars